

Detection of red dye in diesel oil using UV-absorption and silicon photo detector



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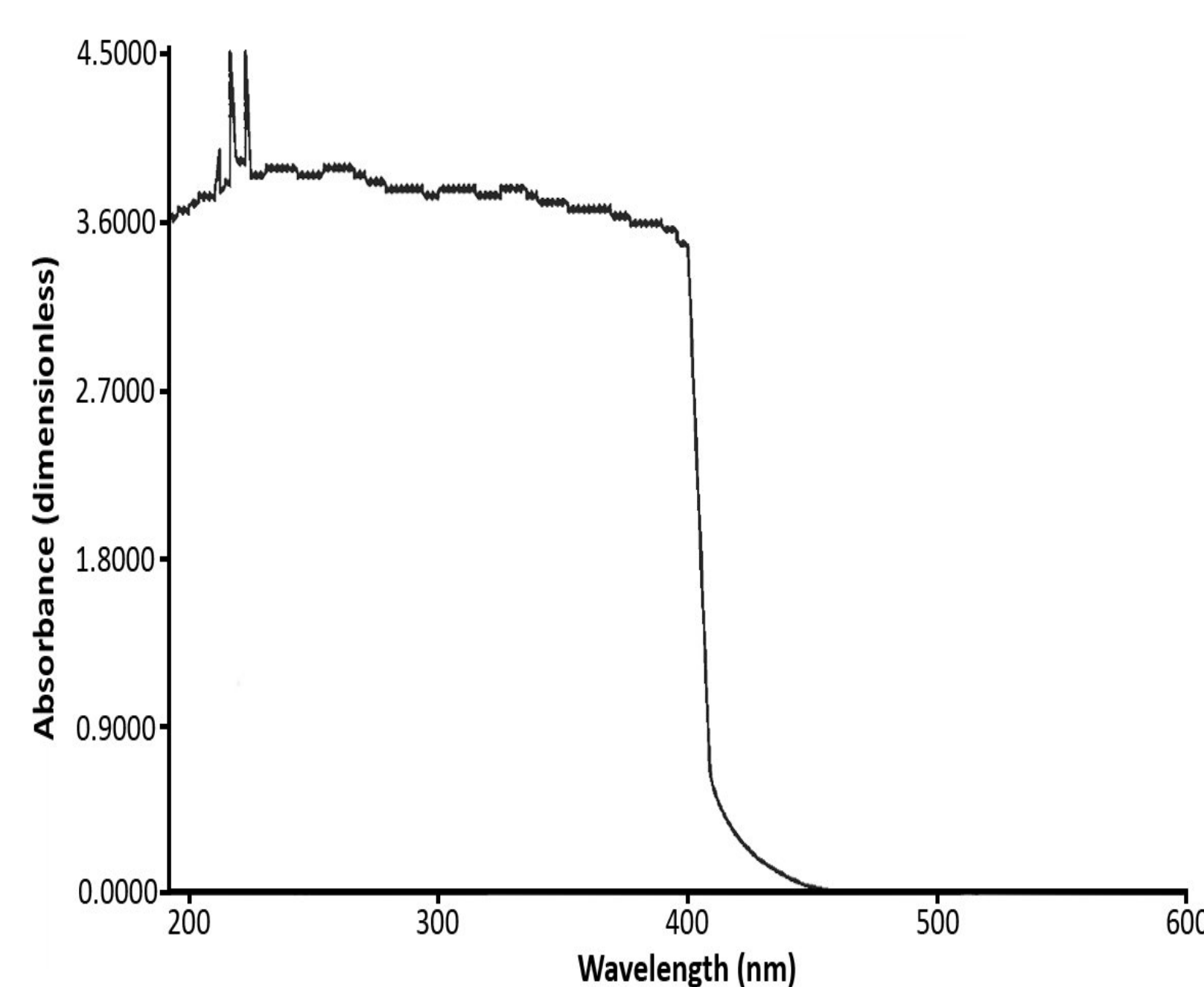
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Abstract

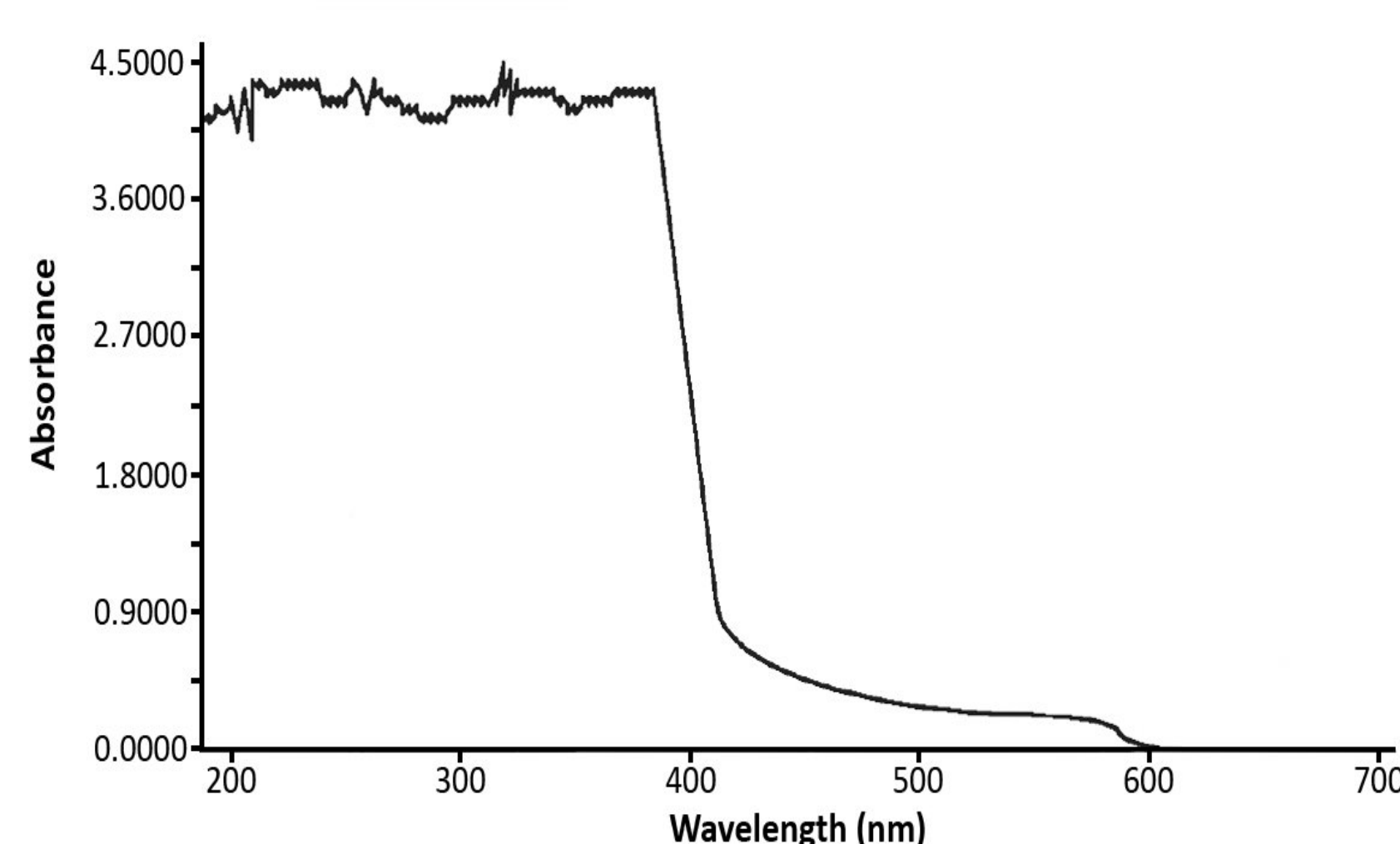
Developing a sensitive and effective instrument for detecting the presence of red dye in diesel fuel is very advantageous for governments in preventing tax loss by controlling illegal use of the diesel fuel. The objective of this work has been to investigate and develop an instrument to detect red dye in diesel, based on the principle of absorption. The peaks of absorption in red and pure diesel fuel were measured with the help of UV-spectrometer (Lambda 6/ PECSS). Optical interference filters of wavelengths 405 nm and 616 nm were used to modify the spectral transmittance of an optical system with appropriate spectral absorption characteristics. Two simultaneous light beams of two different colors were sent into the diesel fuel and the transmitted light from the fuel censored by a silicon photo detector. The signal from the detector was then amplified with the help of three operational amplifiers (OP-177) and sent to an analog device (AD 538) which can perform division operation.

The voltage produced when the violet light passes through the medium was divided when the red light passes through the medium in the one quadrant division unit (AD 538). The output voltage from the analog device was measured with the help of a digital multi-meter. The results show that the output voltages decreases with the increase in percentage of red dye in diesel fuel.

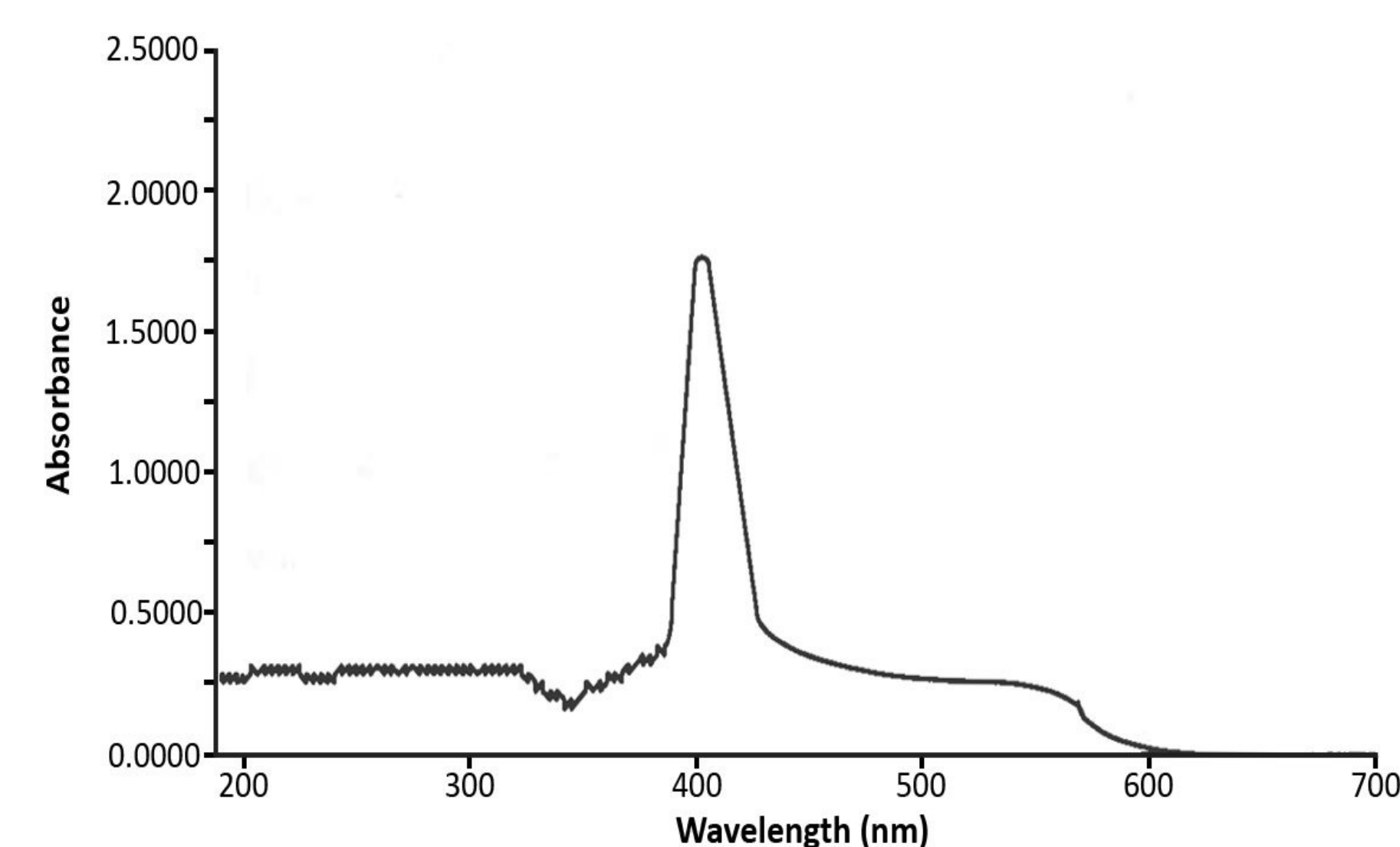
The spectrum of pure diesel oil
with reference air



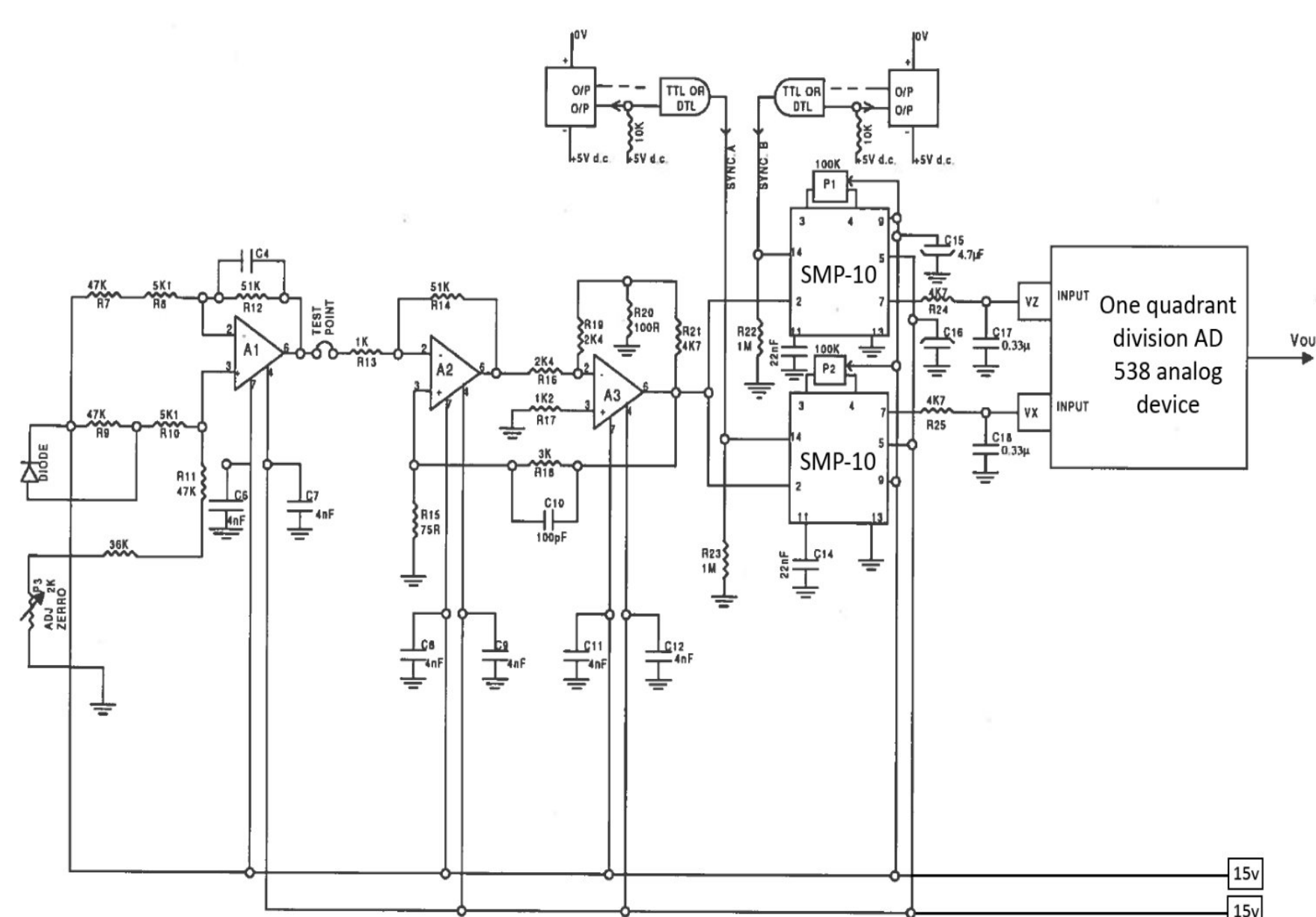
The spectrum of red diesel oil



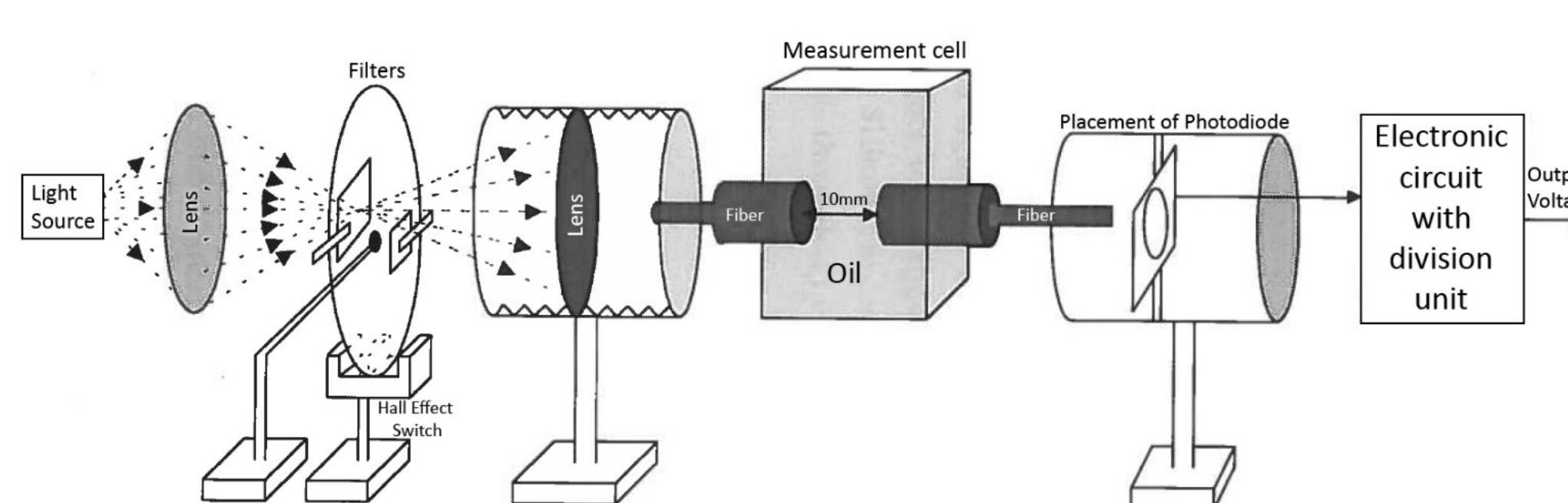
The spectrum of red diesel oil
with reference pure diesel oil



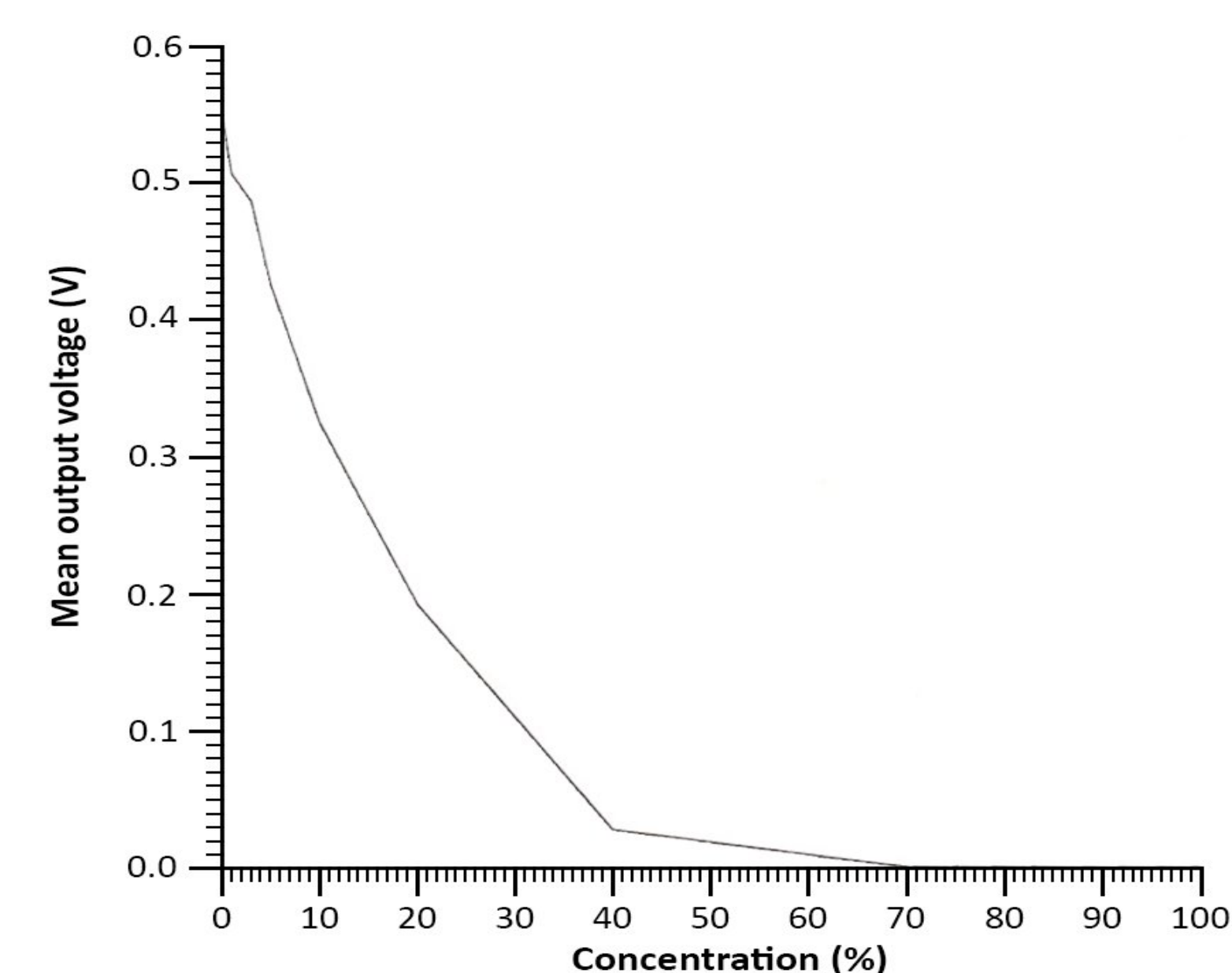
Electronic circuit for the proposed instrument



Experimental setup



Mean output voltage as a function
of concentration



Conclusion

The aim of this project was to develop a prototype instrument to detect the presence of red dye in diesel fuel. Due to some practical and availability problems, it was not possible to develop a prototype instrument for field use at this time. Nevertheless, the experiments show that in spite of the possible constraints of design errors, the proposed instrument can be used to detect the presence of red dye in diesel oil in the concentrations of interest for controlling illegal use in ordinary motor vehicles.

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